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# FLORISTIC RESEARCH WORK IN ANDHRA PRADESH

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## INTRODUCTION

There is comprehensive flora of Andhra Pradesh the fifth largest state in India (2, 75909 sq. km). Coastal Andhra Pradesh occupies two-thirds of peninsular India along the east shore (Sastry & Rao, 1973) stretching for about 960 km (Rao, 1978). The hilly and mountain tracts of the state are some of the most fascinating areas in South India. The legendary Dandakaranya (possibly comprises a major part) of the Eastern Ghats is situated in Andhra Pradesh with Ananthagiri, Bhadrachalam, Chintapalli, Gudem, Maredumilli, Nallamalais, Paderu, Papi, Rampa and Seshachalam hills, not to mention the veritable hilly terrains of the erstwhile Hyderabad State. The twenty three districts of the state are generally grouped into three geographically distinct regions called (i) Circars or Coastal Andhra (with nine districts), (ii) Rayalseema (with four districts) and (iii) Telangana (with ten districts).

Most of the floristic studies were conducted when the state was a part of the Madras Presidency (Roxburgh, 1795-1819; Elliot, 1859; Beddome, 1869-74; Hooker f., 1872-97; Gamble 1884-85; Gamble & Fischer, 1915-35) or while under the former Nizam's dominions of Hyderabad (Bradley, 1849; Walker, 1849, Patridge, 1911). The district gazetteers released by state governments, from time to time, contained terse accounts on the flora.

The data hitherto available on the flora of Andhra Pradesh were mostly due to the sustained contributions of the Botanical Survey of India. Contributions have also come from the research faculties of the universities.

The floristic work conducted so far is presented here under two heads : (i) that was done before and (ii) after the formation of Andhra Pradesh.

## FLORISTIC WORKS BEFORE THE FORMATION OF ANDHRA PRADESH

Nearly two centuries ago, William Roxburgh pioneered a (1795-1819) survey of the plants of the coast of Coromandel. He gave vivid accounts of the plants of Rajahmundry, Samalkot, Tuni and Vishakhapatnam. Each plant was provided with Telugu, English and generic names; locality of occurrence; and the features of the wood. He indicated the main components of the flora to be *Acacia catechu* (L. f.) Willd., *Adina cordifolia* (Roxb.) Hook. f. ex Brandis, *Aegle marmelos* L., *Ailanthus excelsa* Roxb., *Anogeissus latifolia* (Roxb. ex DC.) Wall. ex Guill. & Perr., *Dalbergia latifolia* Roxb., *Feronia elephantum* Correa, *Hardwickia binata* Roxb., *Prosopis cineraria* (L.) Druce, *Tectona grandis* L. f., *Terminalia tomentosa* Wight & Arn., etc. His observations also included amongst others such varied details as the classification of teak and cotton into varieties; cultivation of sugar-cane; and methods of extraction of dyes from plants. He added excellent coloured illustrations to the plants studied.

Elliot's (1859) account on the plants of Andhra area of his time, was mostly borrowed from Roxburgh's work. Later contributions were those of Barber, Beddome, Calder, Fischer, Gamble, Hooker f., Lushington, Narayanaswamy, Ramaswamy, Rangachari, Tadulingam, *et al.* Most of these works often find mention in Gamble and Fischer's 'Flora of the Presidency of Madras' (1915-1935). References to plants of Vishakhapatnam, Palakonda, Madugula, Yetrakonda, Ramapachodavaram, Nallamalais, Krishna and Godavari basins and various other places (generalized as Northern Circars and Eastern Ghats) are legion in this work. The districts of Srikakulam, Vijayanagaram, Vishakhapatnam and Upper Godavari (present East Godavari) come under his Sal region, whilst the Lower Godavari (present West Godavari), Krishna, Guntur, Kurnool, Ananthapur, Cuddapah, Chittor and Nellore in the Deccan region. Sunderaraj's (1958) notes on the preparation of Gamble's Flora (with photographs of Gamble and Fischer) make interesting reading. In 1930, Uhl prepared a list of herbs, shrubs, vines and trees of Guntur together with details about phenology, colour of flowers and vernacular names. This, the first Flora of a town in the state. Unfortunately, is now out of print.

Patridge (1911) studied the flora of the dominions of Hyderabad followed by Ghousuddin (1936), Sayeeduddin (1935, '38, '39-'47), Narayan (1939), Salam (1940), Vahid (1944), Suxena (1944-46) and Khan (1953-54). Chatterjee's (1939) list of endemic genera and species from India also included Andhra Pradesh. One such genus was *Neopeltandra* Gamble, now a synonym of *Meineckia* (see Webster, *Acta Bot. Neer.* 4 : 323-365. 1965). In 1943, a review of the state's flora was given by J. Venkateswarlu. Apart from dealing with the natural flora, he gave classified accounts of species forming sources of timber, bamboo, sandalwood, fuel, gum, drugs, dyes, match-box wood, and tannins. He further drew attention to the potentialities of agriculture in the state, together with suggestions for its improvement. V. Venkateswarlu (1942-'44, '46) studied the estuarine flora of the Krishna and Godavari rivers. He recorded the rare, *Psilotum nudum* (L.) P. Beauv., near Kakinada of East Godavari District.

## FLORISTIC WORK AFTER THE FORMATION OF ANDHRA PRADESH

This part deals with two aspects ; one that covers the floristic works embracing larger areas of the state, the other covering restricted areas. The latter also includes the floristic data arranged in the form of district-wise accounts, new records, and new species described.

### *Floristic works covering larger areas of the state* :

I. Forest types of Andhra Pradesh formed the subject matter of a thesis of Subbarao (1960). Karthikeyan (1971a, b ; '72) published supplements to the Poaceae of erstwhile Presidency of Madras. Nayar & Ramamurthy (1973) prepared a third list of additions to Hooker's flora, which included several new records from Andhra Pradesh.

Rao & Sastry (1971, '72, '74a, b), Rao, Sastry & Shanware (1972) and Sastry & Rao (1973) made valuable contributions to the flora of coastal Andhra Pradesh. They distinguished two main types of coastal vegetations namely, strand and estuarine. In each type, there are several sub-categories. The study on Coringa tidal estuary of the Godavari complex by Rao *et al.* (1972) is a notable addition. Of the species which occupied the intertidal belt of this area, the following are important : *Avicinnea alba* Bl., *Bruguiera gymnorrhiza* (L.) Lam., *Ceriops decandra* (Griff.) Hou. *Excoecaria agallocha* L., *Hibiscus tiliaceous* L., *Lumnitzera racemosa* Willd., *Rhizophora api-*

*culata* Bl., *R. mucronata* Lamk., *Sonneretia apetala* Buch.-Ham., and the pioneering grass *Porteresia coarctata* (Roxb.) Tateoka.

A preliminary review of the contribution to the flora of Andhra Pradesh was written by P. N. Rao (1972) in Telugu. Later, Hemadri *et al.* (1976) surveyed the medicinal plants of the state. Ethnobotanical studies for certain areas in the state were made by Pal & Banerjee (1971) and Jain *et al.* (1973). Wagh's (1956-61) doctoral thesis entitled 'Studies on the Flora of Andhra State' would be valuable if published. Rao, Raju & Subramanyam (1979) have prepared an account of the Eriocaulaceae of Andhra Pradesh, under publication including 12 species of which four are new records for the state.

II. *District accounts* : Only those districts for which floristic data exist are being given here in alphabetic order.

CHITTOOR DISTRICTS : *Pimpinella, tirupatensis* Bal. & Subr. was described from type material collected in Tirupati (Balakrishnan & Subramanyam, 1960b). Naidu (1966a, b) noted 286 medicinal plants from Tirupati. Naidu & Rao (1967, 69) and Naidu *et al.* (1971) enumerated the flora of Tirumala Hills. Subramanyam (cf. Suryanarayanan, 1973) recorded the occurrence of *Psilotum nudum* (L.) P. Beauv. in Tirupati. *Cycas beddomei* Dyer is another important record from here. Rao & Rao (1968) noted the occurrence of *Gnetum ula* Brongn. from Rayalaseema as a new record for Andhra Pradesh, but this was known much earlier from several parts of the Eastern Ghats of Vishakhapatnam District. *Leucas lavandulifolia* var. *nagalapuramiana* is a new addition to the flora of this district (Chandrabose & Srinivasan, 1978).

CUDDAPAH DISTRICT : Balakrishnan & Subramanyam (1960a) described *Euphorbia senguptae* from Guvvalacheruvu. Ellis (1966) surveyed 26 sq km area of the Balapalle range. Earlier collections from this area in the Madras Herbarium (MH) are those of Beddome, Gamble (with late 19th century dates) and Jacob (with early 20th century dates). Ellis' (1966) collection of 374 taxa of 78 families also are in MH. He described the vegetation as dry deciduous type, with an average rain fall of 40 cm. Naidu & Rao (1966) have also published an account on the dicotyledonous flora of this district.

EAST GODAVARI DISTRICT : Rao (1959) gave an appraisal of the mangrove vegetation of the Godavari estuary after a preliminary report about the same by V. Venkateswarlu in 1944. R. S. Rao (1958, '64) explored an area of 300 sq miles of Eastern Ghats covering Addatigala, Etrakonda, Gudem, Rampachodavaram, Maredumilli, Sambarkonda, etc. Sambarkonda with an altitude of 1,550 m is possibly the highest area in the state. Interesting subtropical & temperate plants such as *Alsophila, Botrychium, Gleichenia, Lycopodium, Peperomia* are found in this place. It is stated that in Rampa coffee cultivation was there, as early as 1898. The wild occurrence of *Cymbopogen citratus* Stapf and *Nyctanthes arbortristis* L., was also mentioned. Some of the floristic elements of Assam and Burma were also met with here. Subbarao & Kumari (1967) recorded *Beilschmiedia sikkimensis* King ex Hook. f. (Lauraceae) from Ramavaram to Nulakamaddi at an altitude of 525 m. A doubtful (excluded) *Impatiens* mentioned by Bhaskar & Razi (1978) was said to have been collected from Sarvapuram (correctly Sarpavaram), by J. Venkateswarlu which is the place of occurrence for the monotypic *Hydrocera* (cf. Venkateswarlu & Dutt, 1961). From the photograph, the species in question appears to be *Hydrocera triflora* Wight & Arn. [ = *Tytonia triflora* (L.) C. E. Wood].

GUNTUR DISTRICT : A new species, *Iseilema venkateswarluii* Satyavati was collected from Lam Farm area on 25-9-1966 (Uppuluri & Satyavati, 1968). Rao & Raju (1978) initiated the publication of their studies on the ecofloristics of Nagarjunanagar, a 300 acre area in which the Nagarjuna University is located. Their observations were commenced in August 1976. Also additions to Uhl's 'Guntur Flora' have been prepared by them. From the environs of Nagarjunanagar, 473 species in 324 genera and 84 families, have been recorded. An ecofloristic study of Guntur district has been planned by A. S. Rao and P. N. Rao of Nagarjuna University, with assistance from interested teachers of various affiliated colleges. The estuarine flora of Nizampatnam needs a fresh survey as this area has not been covered by Sastry & Rao (1973). A taxonomic study of the genus *Chamaesyce* Gray (Euphorbiaceae) in the state was taken up by the present authors (*see* Raju & Rao, 1977, '78).

HYDERABAD DISTRICT : Medicinal flora of Hyderabad and its suburbs was described by Prakasarao (1966). Ramayya & Rajagopal (1968, '71, '75) and Rajagopal & Ramayya (1968, '70) took up the floristic studies of this district along with taxonomy and anatomy of certain groups. Notable new records from here were : *Bacopa floribunda* (R. Br.), Wettst., *Rotala illecebroides* Koehne (endemic) and *Pseudowolfia hyalina* (Del.) Hart. & Plas. (a new record for Asia itself).

KARIMNAGAR DISTRICT : During July and Dec., 1964 and Sept.-Oct., 1965, Subbarao & Kumari (1967) explored Kodimial, Manthani and Raikal. They listed 434 species of which *Curcuma pseudomontana* Grah. and *Theriophonum wightii* Schott happened to be new records for the State. Later, Kapoor & Kapoor (1973) prepared some additions to the flora of this district.

KRISHNA DISTRICT : After V. Venkateswarlu (1946) studied the estuarine flora of Krishna river, Sastry & Rao (1973), in their study, covered Manganapudi estuary near Machilipatnam, Kondapalli hill range is worth exploring.

KURNOOL DISTRICT : *Boswellia ovalifoliolata* is a new species described by Balakrishnan & Henry (1961). There are scattered reports of the flora of this district by Barber, Beddome, Gamble, Jacob and Rangachari. Ellis (1968) conducted five exploration tours during 1963-65 to the famous Nallamalais, extending from Palanadu in the North to Tirupati in the South, 430 km in length and 30 km in breadth with an average altitude of 300-900 m. The highest altitude was 1000 m at Virannakonda. He recorded 596 species. The vegetation was found to be of the dry as well as moist deciduous types. Gundlabrahmeswaram, in the heart of Nallamalais, belonged to the latter category. A strip of semi-evergreen forest remained at the Krishnanandi area. *Andrographis nallamalayana* Ellis and *Euphorbia linerarifolia* Roth. var. *nallamalayana* Ellis, *Roshellularia Vahlii* (Roth) Nees var. *rupicola* Ellis, were three new taxa described from here (Ellis, 1966b, c). *Crotalaria madurensis* Wight var. *kurnoolica* Ellis & Swaminathan (1969) was also described from this district. The famous hill shrine Srisailam with its rich flora is in this region. Recently, in Srisailam near the Dam, V. S. Raju located *Euphorbia agowensis* Hochst. ex Boiss. which forms a new record for the state. (Raju & Rao, 1979c).

MEDAK DISTRICT : Sebastine *et al.* (1960) enumerated 268 species from Dosalagunda (lake), Peddagutta, Pegarigutta, Madikonagutta, Naraspur, Rustumpet and Vuracheruvu (lake). In the forest, they came across teak, species of *Diospyros* and *Gymnosporia* and *Myrobalams*.

NALGONDA DISTRICT : Thothathri (1964a) explored Nagarjunakonda and its surroundings and recorded 251 species belonging to 156 genera of 45 families. *Sida ovata* Forsk., formed a new record for South India. He has also described a new variety, *Crotalaria paniculata* Willd. var. *nagarjunakondensis* Thothathri.

NELLORE DISTRICT : Suryanarayana's (1973 a-c) accounts were mainly concerned with the vascular flora of Venkatagiri and Udayagiri. He collected orchids like *Eulophia epidendraea* (Retz.) Fischer and *Habenaria roxburghii* Nicols., from Malleswarakonda. From Venkatagiri, he reported *Psilotum nudum* (L.) P. Beauv. Rao & Sastry (1974) found the localized occurrence of *Psilostachys sericea* Hook. f. at Krishnapatnam near Nellore. This is phytogeographically interesting since this species occurs elsewhere, in Saurashtra. Two more new records from this district were : *Sympagis petiolaris* (Nees) Brem. and *Canscora perfoliata* Lam. (Suryanarayana & Murthy, 1974). The latter has been claimed as the first record for the entire eastern belt of the Peninsula.

NIZAMABAD DISTRICT : Bahadur (1975) collected *Neanotis montholoni* (Hook. f.) Lewis from Kamareddy which was a new record for the state. This was known earlier only from the South-Western Ghats.

WARANGAL DISTRICT : Sebastine & Henry (1966) published the flora of Pakhal, Narasampet taluk. The vegetation was found to be of the mixed deciduous type with a few evergreen trees. The survey yielded 254 species in 198 genera and 70 families. Ramayya & Rajagopal (1971) recorded *Elatine ambigua* Wight and *E. triandra* Schkuhr. from Ramappa temple and Pakhal areas, respectively.

WEST GODAVARI DISTRICT : Very little is known about the flora of the hills lining the river Godavari, as noted by Gamble (1884). D. C. S. Raju (1966a, c) studied the flora of Polavaram and the legendary Papi hills. Later, he (1968) surveyed Bedadamuru, Jilugumilli, Jangareddygudem, and Ravigudem (environs of Bhadrachalam) areas. *Begonia picta* Sm., *Chlorophytum orchidastrum* Lindl., *Curcuma decipiens* Dalz., *Desmodium laxiflorum* DC., and *Galctia villosa* Wight & Arn., were listed as new records. Recently, Seshavatharam (1974) reported 43 aquatic weeds from the paddy fields and irrigation canals of this district.

VISHAKHAPATNAM DISTRICT : A new species, *Argyreia arakuensis* Balak. was reported from Araku by Balakrishnan (1961). D. C. S. Raju (1966b) listed the following as new records for the Eastern Ghats of Simhachalam : *Cyanotis arachnoidea* Clarke, *Dysophylla mysuroides* Benth. and *Phyllanthus rheedii* Wight. Subbarao & Kumari (1967, '71, '72) published several new records for the Eastern Ghats of this district, they are : *Argyreia roxburghii* Chois. var. *ampla* Clarke, *Chirita hamosa* Wall. ex R. Br., *Enhydra fluctuans* Lour., *Ensete glaucum* Roxb., *Eriocaulon luzulifolium* Mart., *Eulophila explanata* Lindl., *Prunus jenkinsii* Hook. f., *Raphidophora decursiva* (Roxb.) Schott, *Saussurea heteomalla* (D. Don) Hand.-Mazz., *Tinospora malabarica* (Lam.) Miers, (a relict species from Adapavalasa). From Cherukonda, Subbarao & Kumari (1978) described *Kalanchoe cherukondensis*. Earlier, they (1969, '70) described *Leucas mukerjiana* and L. *mollissima* Wall. var. *sebastiana* from this place.

The 'Flora of Vishakhapatnam' (Venkateswarlu *et al.*, 1972) included 570 species of 90 families. An annotated list of the coastal algae of Waltair was prepared by Umamaheswararao & Sreeramulu (1970). This is one of the few accounts of the marine algae of the state. Raju & Rao (1976a, b) reported *Cuscuta chinensis* Lam. and *C. approximata* Bab., as new records. They also prepared additions to the flora of Vishakhapatnam together with some nomenclatural changes.

The senior author in his various annual botanical excursions, collected *Psilotum nudum* (L.) P. Beauv. consistently on the hills near 62nd milestone at Sunkarametta. This area also revealed certain elements of a tropical rain forest, chief among them is a fern, *Trichomanes*. According to him, an unidentified species of *Scaevola* L., occurs along Vishakhapatnam coast on Dolphin's-nose hill slopes, facing the sea. In 1974, V. S. Raju collected *S. taccada* var. *taccada* from Ramakonda near Rambilli village (unpubl.). Rao & Sastry (1974) doubted the occurrence of *S. plumieri* Vahl in coastal Andhra. They recorded the following taxa as new to the state from this district; *Blepharis repens* (Vahl) Roth, *Dimorphocalyx glabellus* Thw. and *Pachygone zeylanica* (Gaertn.) Sant. & Wagh. They also mentioned the restricted distribution of *Indigofera aspalathoides* Vahl and *Eulophia epidendraea* Fischer. They did not mention *Eriocaulon quinquangulare* L., which was found occurring on the coastal dunes at Rambilli (V. S. Raju, unpublished).

## CONCLUSIONS

It is thus clear that there are large gaps and almost all the districts have to be explored. Floristic work in Adilabad, Anantapur, Khammam, Mahaboobnagar, Nizamabad, Prakasam, Rangareddy and Srikakulam districts has to be initiated. Besides enriching the data on vascular flora of this state, there is also an urgent need to know about other groups of plants as well.

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